species have n=10, and four species have n=11. The prevalence of polyploidy in one section and aneuploidy in the other undoubtedly reflects a fundamental difference in genetic systems and a corresponding phylogenetic separation of the two sections.

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A REVISION OF THE GENUS THAXTEROGASTER SINGER

Rolf Singer and Alexander H. Smith[1]

Since the original publication of the genus *Thaxterogaster* (Singer, 1951) and the subsequent monograph (Singer & Smith, 1958), further studies have been made as time and available material permitted, and these have led to the discovery of additional species. Species are here grouped into sections, since certain distinct trends are now evident. Those species treated in detail in our monograph (*loc. cit.*) are not redescribed here, but detailed accounts of new or transferred taxa are treated critically.

We wish to acknowledge assistance from the National Science Foundation, which made possible the studies at the Royal Botanic Gardens, Kew, England. We also express our thanks to Dr. G. Taylor, Director of the latter institution, for the privilege of studying the collections there, and to Dr. Clark Rogerson, Curator, New York Botanical Garden, New York, for the opportunity to study the collections of *Hymenogaster* at that institution.

[1] Papers from the Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Buenos Aires, Argentina, and the University Herbarium and Department of Botany (Paper no. 1142), the University of Michigan, Ann Arbor, Michigan, U.S.A.

Key to Sections of Thaxterogaster

A. Clamp connections present on hyphae of the gastrocarp.
  B. Spores small (rarely up to 13 μ long), either smooth or with an adhering verruculose-rugulose exosporial ornamentation . . Sec. 4. *Microsporogaster*
  B. Spores larger and always distinctly ornamented.
    C. Spores angular when immature, subglobose . . . . Sect. 2. *Blestogaster*
    C. Immature spores not angular . . . . . Sect. 3. *Thaxterogaster*

A. Clamp connections absent.
  D. Spores with an apical beak and the wrinkled outer layer of the wall loosening to a considerable extent . . . . . Sect. 1. *Scabrogaster*
  D. Spores lacking a distinct apical beak and the exosporial ornamentation adhering to the inner wall . . . . . Sect. 5. *Aporpogaster*

Sect. 1. **Scabrogaster** Singer & Smith, sect. nov.

Sporis subrostrato-mucronatis, ornamentatione subrugulosa separabili.

Typus. *Thaxterogaster scabrosum* (Cooke & Massee) Smith & Singer.

1. **Thaxterogaster scabrosum** (Cooke & Massee) Smith & Singer, comb. nov. *Secotium scabrosum* Cooke & Massee, Grevillea 20:35. 1891.

Peridium hemispherical, depressed, dingy-olive or grayish, minutely scabrid. Gleba lacunose, septa gill-like, waved and folded, dark reddish brown. Stipe very short, almost obsolete.

Spores 15–18 (20) $\times$ 7.5–10 μ, dark rusty brown in KOH, near yellowish tawny in Melzer's reagent; with a slightly wrinkled outer layer which tends to loosen variously, the plage area not differentiated; apex tapered to a blunt-pointed beak-like projection but this consisting entirely of wall material (no pore present).

No other microscopical details obtainable from type.

It is clear from the type, the original description, and Smith's observations on the spores that this species is a *Thaxterogaster* connecting that genus to the group of species in *Hymenogaster sensu lato* with spores having an outer wrinkled wall and an apical beak. This group in *Hymenogaster* makes up the largest element in that genus of diverse spore types.

Type studied. "On the ground. Domain, Melbourne (Baron Mueller" (K).

Sect. 2. **Blestogaster** Singer & Smith, sect. nov.

Sporis subglobosis, juventute plus minusve angulosis.

Typus. *Thaxterogaster brevisporum* Singer.

2. Thaxterogaster brevisporum Singer, Persoonia 1:386. 1960.

We emphasize the angularity of the spores because this feature may be of some importance in connecting the species to members of *Hymenogaster sensu lato.*

Sect. 3. Thaxterogaster.

Spores ellipsoid, over 13 μ long, never angular, not with a distinct apical beak, the outer layer of spore wall adherent to inner layer; hyphae having clamp connections at the septa.

Key to Species of Section Thaxterogaster

A. Peridium lacking a thick gelatinous epicutis.
  B. Peridium pallid, becoming brownish . . . . . 6. *T. magellanicum*
  B. Peridium violaceous.
    C. Spores mostly 15–18 μ long; stipe poorly developed; growing under *Nothofagus pumilo* . . . . . 3. *T. violaceum*
    C. Spores mostly 13–15 μ long; stipe well developed; growing under *Nothofagus dombeyi* and *Saxegothaea* . . . . . 4. *T. dombeyi*

A. Peridium with a thick gelatinous epicutis.
  D. Peridium white . . . . . 7. *T. leucocephalum*
  D. Peridium olive yellow to bister . . . . . 5. *T. pingue*

3. Thaxterogaster violaceum Singer, Mycologia 43:216. 1951, and Brittonia 10:207. 1958.

4. Thaxterogaster dombeyi Singer, Persoonia 1:385. 1960.

5. Thaxterogaster pingue (Zeller) Singer & Smith, Brittonia 10: 211. 1958. *Secotium pingue* Zeller, Mycologia 33:211. 1941.

6. Thaxterogaster magellanicum Singer, Mycologia 43:219. 1951, and Brittonia 10:208. 1958.

7. Thaxterogaster leucocephalum (Massee) Singer & Smith, Brittonia 10:210. 1958. *Secotium leucocephalum* Massee, Grevillea 19:95. 1891.

The following data are taken from the holotype at Kew: Peridium duplex, the outer layer a thick gelatinous layer of appressed hyaline narrow hyphae with clamp connections. Inner layer of floccose broader (5–12 μ) hyphae. Tramal plates of interwoven hyphae yellowish in KOH (but not reviving well and apparently not gelatinous). Details of hymenium not obtained. Spores 12–16 $\times$ 7–8 μ, warty rugulose and rusty brown in KOH (as in *Cortinarius*).

These data on the holotype verify the characters of the species as published previously by us (*loc. cit.*).

Sect. 4. **Microsporogaster** Singer & Smith, sect. nov.

A sectione Thaxterogastero sporis minoribus, interdum sublevibus differt.

Typus. *Thaxterogaster subalbidum* Smith.

Key to Species of Section Microsporogaster

A. Spores almost smooth; stipe-columella solid . . . . . 8. *T. subalbidum*
A. Spores verruculose-rugulose; sterile base chambered, columella hollow (at least when dried) . . . . . 9. *T. fragile*

8. **Thaxterogaster subalbidum** Smith, sp. nov.

Sporis sublevibus; stipite columellaque solidus.

Typus. Thaxter, Fungi Hypogeus No. 4, March 5, 1906, Punta Arenas, Chile, South America (FH).

Gastrocarp 1–2 cm. broad (estimated on basis of dried material), irregularly globose to convex, the surface silky and white, drying whitish; gleba dingy cinnamon brown, of minute chambers nearly filled with

spores; stipe-columella well developed, solid, percurrent, the surface pallid, the interior slightly darker, extending well below the lower margin of the peridium, the estimated length 1–1.5 cm., width 5–7 mm., the peridium either connected to the stipe-columella or free in places to expose slightly the gleba.

Spores 10–13 × 6–8 μ, ellipsoid with a short-pointed, inconspicuous sterigmal appendage, the wall 1.3–2 μ thick (as seen on fractured spores), the surface very minutely warty, wrinkled to punctate-roughened (almost smooth as seen under high dry), pale cinnamon in KOH; no apical differentiation.

Basidia 28–33 × 8–10 μ, clavate, 4-spored, hyaline in KOH. Cystidia none. Basidioles resembling immature basidia. Tramal plates with an indistinct subhymenium of narrow branched elements intergrading with the central area which is of interwoven filaments, some with somewhat enlarged cells, hyaline in KOH. Epicutis of peridium a thick layer of appressed, narrow (2–3 μ), hyaline, smooth, thin-walled hyphae; this layer grading imperceptibly with the context which has broader (4–7 μ) hyphae, some oleiferous hyphae, and is slightly yellowish in KOH; clamp connections present.

The nearly smooth spores separate *Thaxterogaster subalbidum* from the other known Thaxterogasters. In the material in the Zeller collections (NY), a duplicate of the packet of specimens cited above is on the same sheet as the type of *Hymenogaster fragilis*. The description of the latter, however, obviously does not apply to "Fungi Hypogeus No. 4," which we here designate as the type of *T. subalbidum*. Material of *Hymenogaster fragilis* sent to Zeller, apparently by Thaxter, and in the Zeller collections, is marked with red crayon as an indication that it is the holotype of *H. fragilis,* but in the original description of that species the location of the "type" is given as the Farlow Herbarium. We do not know whether Zeller saw all the material or not. The holotype of *T. subalbidum* is that portion of "Fungi Hypogeus No. 4" deposited in the Farlow Herbarium.

9. **Thaxterogaster fragile** (Zeller & Dodge apud Dodge & Zeller) Smith & Singer comb. nov. *Hymenogaster fragilis* Zeller & Dodge apud Dodge & Zeller, Ann. Missouri Bot. Gard. 21:646. 1934.

Gastrocarp 1–2 cm. diam., subglobose to pear-shaped, the surface whitish or gray, drying pallid to pale cinnamon-buff; gleba chambered, *fragile,* the cavities fairly large for a fungus of that size and very irregular in shape, bright cinnamon as dried; stipe-columella consisting of a chambered sterile base, 6 mm. broad (reminding one of the marginate bulb in a *Cortinarius*), this extended into a hollow thin-walled percurrent columella which when dried may be obliterated entirely except for the cavity; gleba attached to the length of the columella (if latter is still evident); peridium even, silky, extending to the stipe-columella (but possibly slightly free at times).

Spores 10–12 × 7–8.5 μ, ovate-pointed and with a short, pointed sterigmal appendage, dull cinnamon brown in KOH, thick-walled, warty-rugulose, the outer wrinkled layer not separating appreciably from the inner one; apical beak solid (lacking a pore).

Peridium with a surface layer of indefinite thickness of appressed filaments 3–6 μ diam., hyaline in KOH, smooth, thin-walled and with medallion clamps at cross walls. This layer intergrading with the context which is composed of broader hyphae and some laticifers (?). Details of hymenium and tramal plates not evident.

Punta Arenas, Chile, March 1906. *R. Thaxter*. Word "type" underlined in red on the packet in the Zeller collections (NY).

The description of Zeller and Dodge obviously applies to this material, which is distinct from the March 5, 1906, collection (i.e., *Thaxterogaster subalbidum*) by the brighter cinnamon, more fragile gleba, ovate-pointed to almost broadly fusoid conspicuously roughened spores, chambered sterile base and hollow columella.

Parks 2182, filed in the Zeller collections (NY) as *Hymenogaster fragilis,* is not the same as either of the Thaxter collections. The spores and the microscopic characters of the peridium are those of the type of *Hymenogaster gilkeyae,* but all the details of the hymenium and tramal plates had collapsed beyond the point of reviving. No clamps were present as far as could be observed.

Sect. 5. **Aporpogaster** Singer & Smith, sect. nov.

Hyphis defibulatis, sporis haud vel vix rostrato-apiculatus; strato externo sporarum haud separabili.

Typus. *Thaxterogaster conicum* (Hesler) Singer & Smith.

Key to Species of Section Aporpogaster

A. Gastrocarp globose, depressed; spores 7–11 μ broad . . . 10. *T. porphyreum*
A. Gastrocarp typically conic and elongate; spores mostly 11–13 μ broad. 11. *T. conicum*

10. Thaxterogaster porphyreum (Cunningham) Singer, Lilloa 26: 105. 1953; see also Brittonia 10:212. 1958. *Secotium porphyreum* Cunningham, Proc. Linn. Soc. N.S.W. 49:114. 1924.

11. Thaxterogaster conicum (Hesler) Singer & Smith, Brittonia 10: 214. 1958. *Secotium conicum* Hesler, Jour. Elisha Mitchell Soc. 49:153. 1933.

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